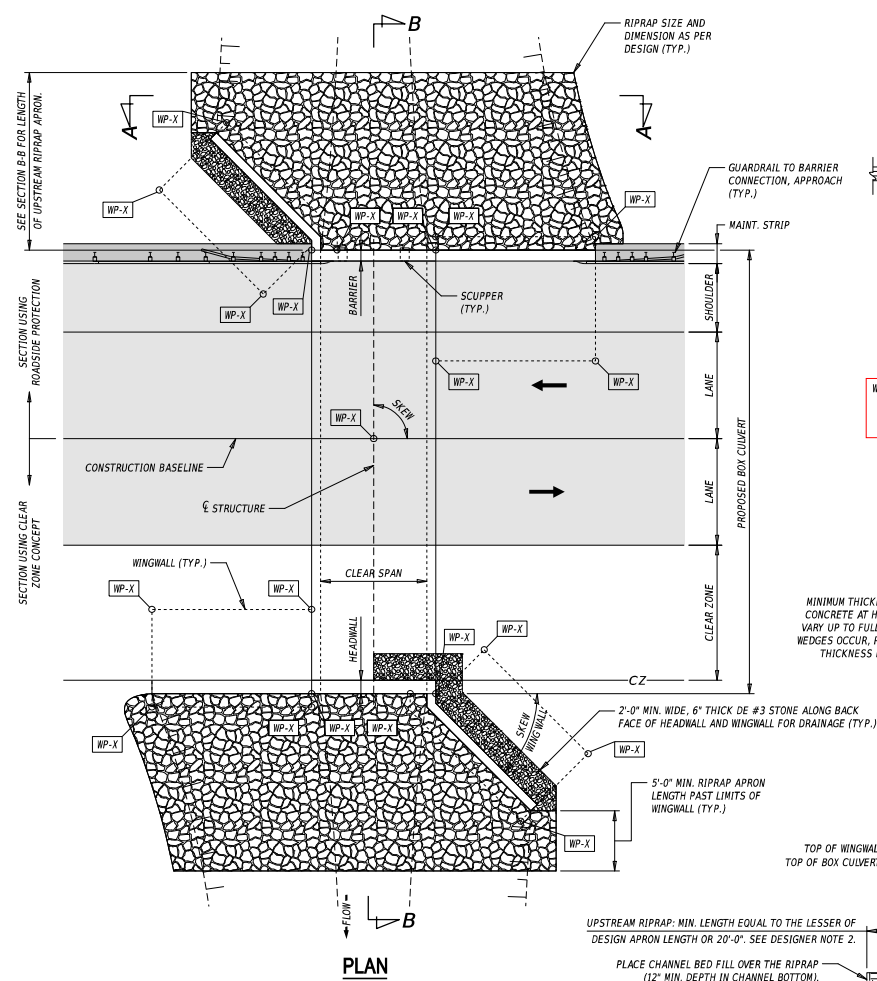
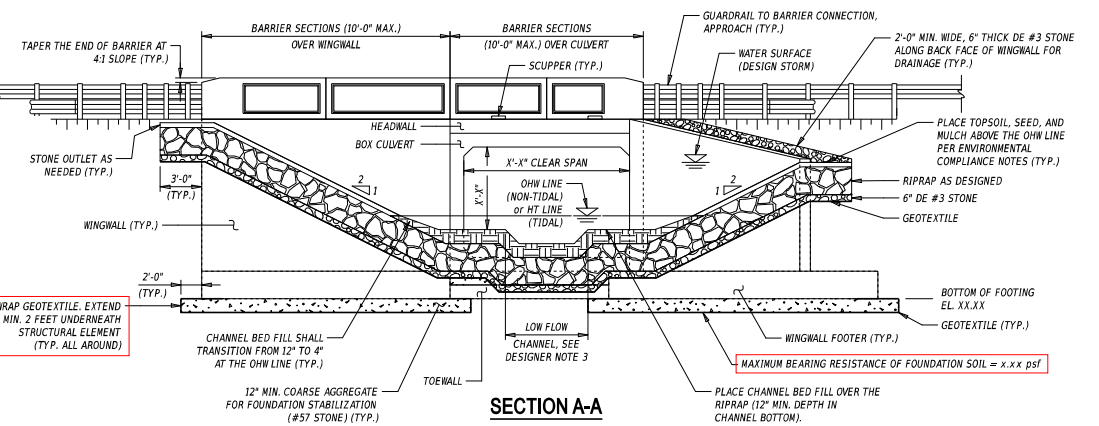


OHW = ORDINARY HIGH WATER
HT = HIGH TIDE

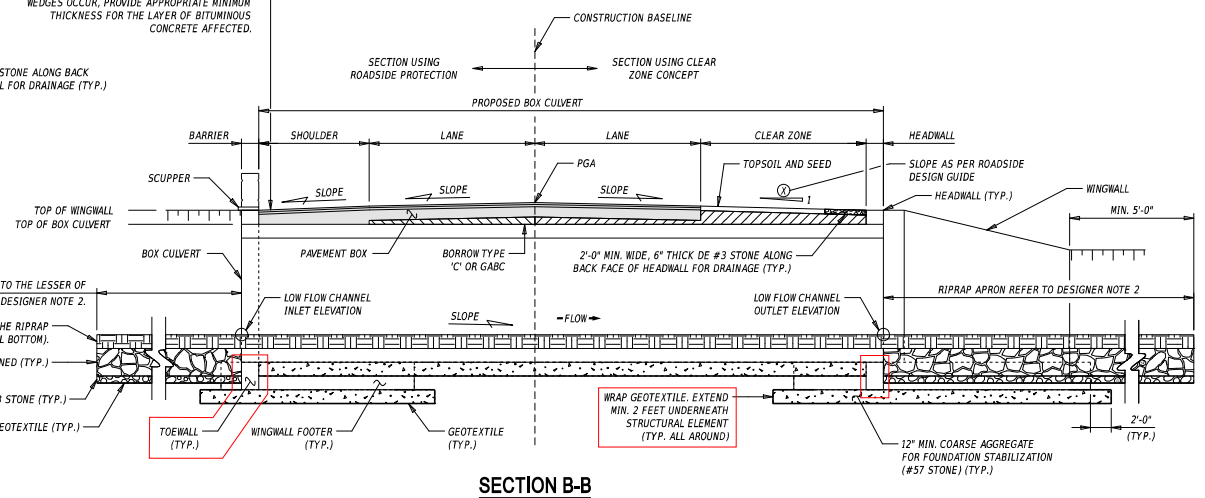


WORKING POINTS				
POINT	STATION	OFFSET	NORTHING	EASTING
WP-X	-----	-----	-----	-----
WP-X	-----	-----	-----	-----
WP-X	-----	-----	-----	-----
WP-X	-----	-----	-----	-----

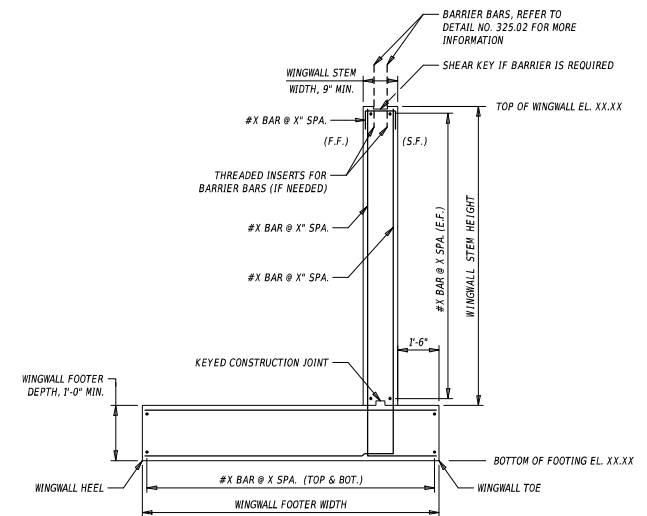
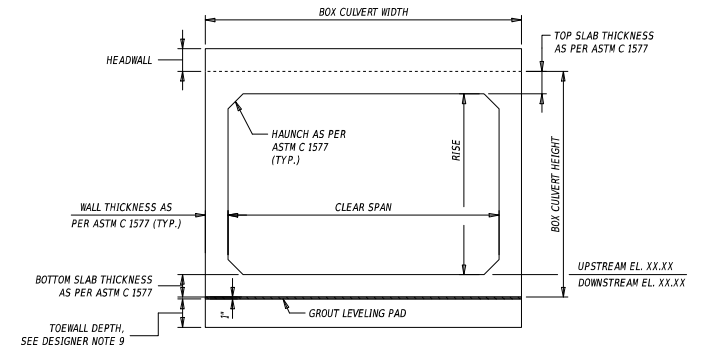
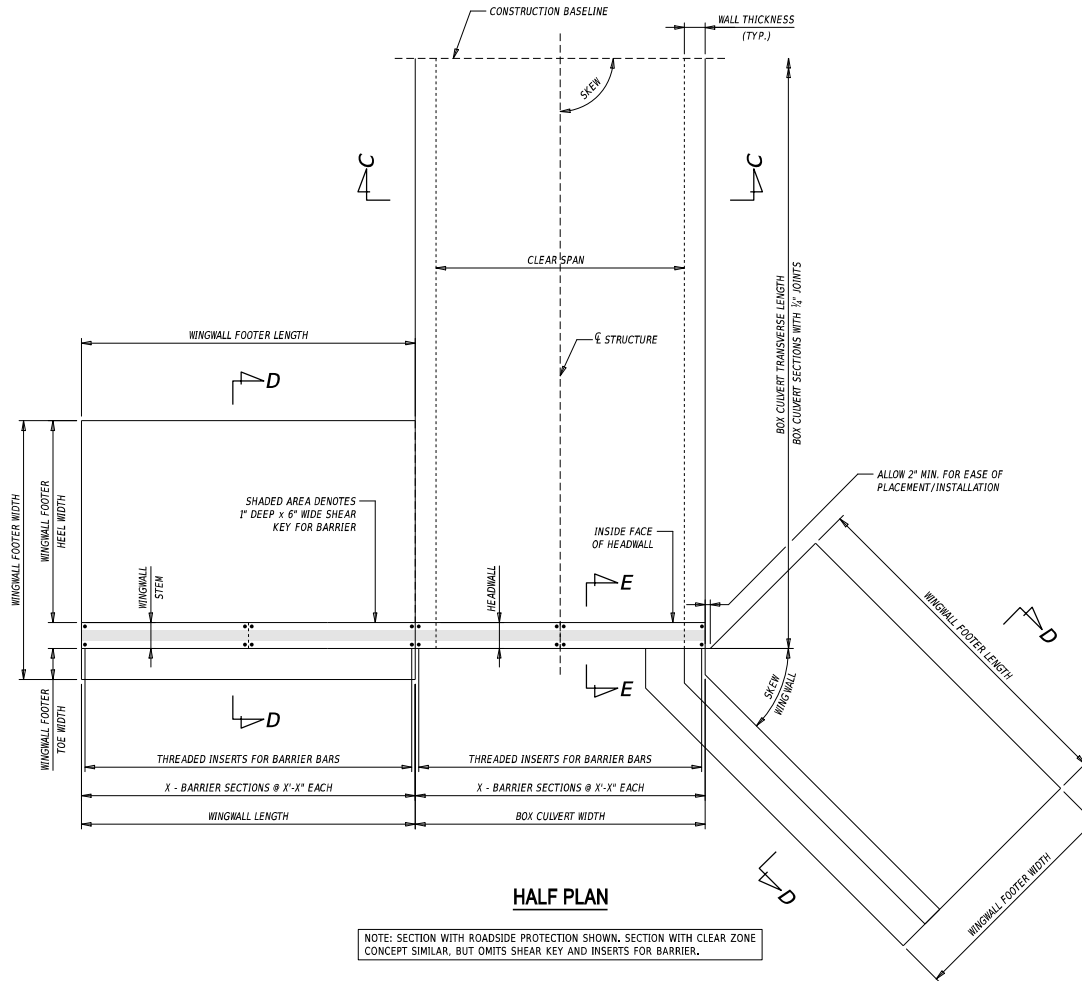


NOTE: REFER TO PROJECT SPECIFIC ENVIRONMENTAL COMPLIANCE SHEET(S) FOR FURTHER INFORMATION ON RIPRAP AND TOPSOIL TREATMENT. EXAMPLE IN SECTIONS A-A AND B-B SHOWN USING LOW FLOW CHANNEL.

MINIMUM THICKNESS FOR TYPE 'C' BITUMINOUS CONCRETE AT HEADWALL = 2" THICKNESS MAY VARY UP TO FULL PAVEMENT BOX DEPTH WHERE WEDGES OCCUR, PROVIDE APPROPRIATE MINIMUM THICKNESS FOR THE LAYER OF BITUMINOUS CONCRETE AFFECTED.

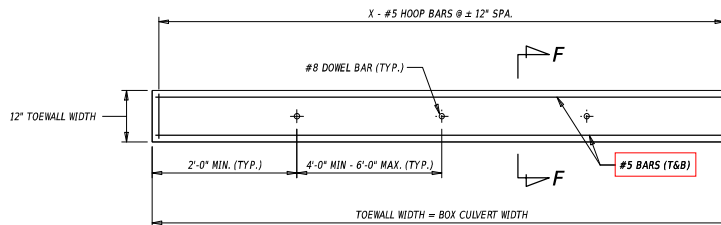


NOTE:
-SPECIFY THE NEED FOR A WATERPROOFING MEMBRANE IF BITUMINOUS CONCRETE IS PLACED DIRECTLY ATOP THE BOX CULVERT. IF GABC OR FILL IS PLACED DIRECTLY ATOP THE BOX CULVERT, APPLICATION OF A WATERPROOFING MEMBRANE IS NOT REQUIRED.
-FOR STREAMS ON SHALLOW GRADE, PLACE RIPRAP FLAT AND BUILD APPROPRIATE CHANNEL SLOPE INTO THE CHANNEL BED FILL.

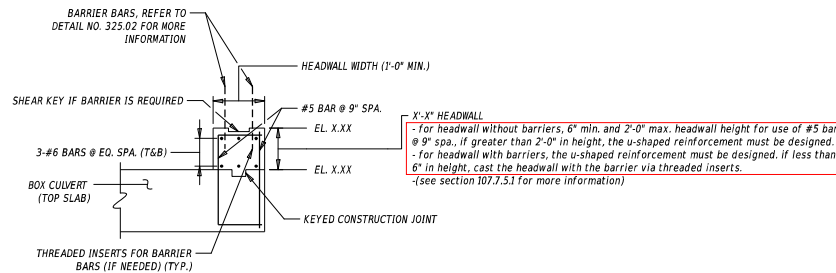


LEGEND
 E.F. - DENOTES EACH FACE
 F.F. - DENOTES FILL FACE
 S.F. - DENOTES STREAM FACE



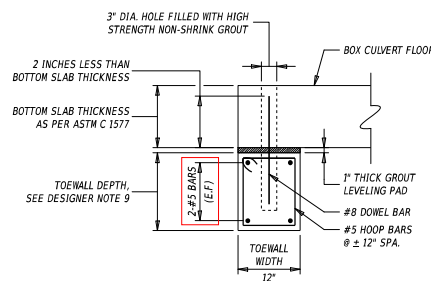


TOEWALL PLAN
(SECTION E-E)



HEADWALL DETAIL
(SECTION E-E)

NOTE: FOR WINGWALL USING CLEAR ZONE CONCEPT OR FLARED WINGWALLS, OMIT SHEAR KEY FOR BARRIER.



TOEWALL DETAIL
(SECTION F-F)

DESIGNER NOTES

1. THE HYDRAULIC CAPACITY OF BOX CULVERTS SHALL BE DETERMINED IN ACCORDANCE WITH SECTION 104 - HYDROLOGY AND HYDRAULIC INVESTIGATIONS.
2. THE SIZE AND DIMENSION OF RIPRAP PROTECTION SHALL BE AS REQUIRED BY HYDRAULIC CALCULATIONS. FOR UPSTREAM OR DOWNSTREAM LIMITS, THE MINIMUM LENGTH MAY BE EXTENDED TO FIT FIELD CONDITIONS (BENDS, SCOUR HOLES, ETC.). THE MINIMUM SIZE OF RIPRAP IS R-4 IF BURIED AND R-5 IF EXPOSED. RIPRAP SHALL BE CONTOURED TO MATCH THE SHAPE OF THE EXISTING STREAM BANKS AT THE PROJECT LIMITS.
3. AS DIRECTED BY ENVIRONMENTAL STUDIES SECTION, A LOW FLOW CHANNEL SHALL BE CONSTRUCTED IN THE RIPRAP AND CHANNEL BED FILL. DIMENSIONS OF THE LOW FLOW CHANNEL ARE LOCATION SPECIFIC AND WILL BE PROVIDED BY THE ENVIRONMENTAL STUDIES SECTION. THIS APPLIES ONLY TO BOX CULVERTS WITH SPANS OF 10'-0" OR GREATER DUE TO THE INABILITY OF THE LOW FLOW CHANNEL CONSTRUCTED SOLELY FROM CHANNEL BED FILL TO HOLD ITS SHAPE INSIDE THE CULVERT BARREL WHEN THE SPAN IS LESS THAN 10'-0".
4. EXAMPLES SHOWN ON SHEET 1 UTILIZE SCUPPERS. THE NEED FOR SCUPPERS SHALL BE EVALUATED ON A CASE BY CASE BASIS.
5. 'GUARDRAIL OVER CULVERTS' AS SHOWN IN DELDOT STANDARD CONSTRUCTION DETAILS MAY BE CONSIDERED FOR BOX CULVERTS (SPANS OF 18'-6" OR UNDER) IN LIEU OF CONCRETE BARRIERS IF THE WINGWALLS ARE FLARED AND THE WIDTH OF THE BOX CULVERT WILL ACCOMMODATE FOR THE MAIN SPACING OF 'GUARDRAIL OVER CULVERTS'.
6. MORE INFORMATION ON BARRIER DETAILS CAN BE FOUND IN DETAIL NO. 325.02 - BRIDGE RAILING DETAILS.
7. NO REINFORCEMENT IS SHOWN IN 'BOX CULVERT (SECTION C-C)' DUE TO ASSUMPTION THAT ASTM C1577 BOX CULVERT SIZES WILL TYPICALLY BE USED. BOX CULVERT SIZES AS SHOWN IN ASTM C1577 SHOULD BE USED WHEN POSSIBLE. BUT IN CASES WHERE BOX CULVERT SIZES OR REINFORCEMENT LISTED IN ASTM C1577 CANNOT BE USED (MOSTLY DUE TO THE NEED TO USE SIZES GREATER THAN 12 FT X 12 FT OR IF THE SKEW IS GREATER THAN 30°), THE DESIGNER MUST DESIGN AND SHOW REINFORCEMENT DETAILS OF THE BOX CULVERT ON THE PLANS, SIMILAR TO SECTION C-C IN DETAIL NO. 360.01 - PRECAST CONCRETE RIGID FRAME DETAILS.
8. WINGWALL LAYOUT:
THE DESIGNER SHALL CONSIDER THE HEIGHT OF THE ROADWAY EMBANKMENT, THE ELEVATION OF THE SURROUNDING GROUND, AND THE DEPTH OF THE STREAM CHANNEL TO DETERMINE THE WINGWALL LAYOUT.
(a.) AT SITES WHERE THERE IS LITTLE OR NO ROADWAY EMBANKMENT AND A DEEP CHANNEL, WINGWALLS PARALLEL TO THE ROADWAY ARE THE PREFERRED OPTION. PARALLEL WINGWALLS FOR SECTION WITH ROADSIDE PROTECTION CAN UTILIZE BARRIER ALONG THE ENTIRE LENGTH (AS DEPICTED IN THIS DETAIL) OR BE OFFSET BEHIND GUARDRAIL (NOT DEPICTED IN THIS DETAIL) WHERE THE BARRIER IS PLACED ONLY ON THE BOX CULVERT OR GUARDRAIL OVER CULVERTS IS USED.
(b.) AT SITES WHERE THERE IS A RELATIVELY TALL ROADWAY EMBANKMENT AND VERY SHALLOW CHANNEL, WINGWALLS PERPENDICULAR TO THE ROADWAY MAY BE USED.
(c.) FOR CASES IN-BETWEEN (THAT HAVE SOME ROADWAY EMBANKMENT AND SOME CHANNEL DEPTH), ANGLED WINGWALLS ARE PREFERRED. 45° WINGWALLS ARE DEPICTED IN THIS DETAIL, BUT 15°, 30°, AND 60° WINGWALLS MAY BE USED BASED ON SITE CONDITIONS. IN ADDITION, WHERE THE STREAM APPROACHES THE BRIDGE INLET AT AN ACUTE ANGLE OF ATTACK, CONSIDER USING A DIFFERENT WINGWALL ANGLE ON THE OUTSIDE OF THE BEND SO THAT THE WINGWALL CAN ACT AS A GUIDE WALL TO HELP DIRECT FLOW IN TO THE INLET.
(d.) AT BOX CULVERTS WITH A HIGH SKEW ANGLE (GREATER THAN 20°), WINGWALLS WITH BARRIER PARALLEL TO THE ROADWAY CAN BE ADVANTAGEOUS FOR GUARDRAIL TO BARRIER CONNECTION, REGARDLESS OF SITE CONDITIONS.
9. TOEWALLS MUST BE EMBEDDED A MINIMUM OF 3'-6" BELOW THE STREAMBED IN ACCORDANCE WITH SECTION 107.7.5.3. IN AN EVENT WHERE THE WINGWALL FOOTINGS ARE DEEPER THAN THE MINIMUM EMBEDMENT REQUIREMENTS, THE BOTTOM OF THE TOEWALL SHOULD MEET THE BOTTOM OF THE WINGWALL FOOTINGS.
10. THE FORMER PRECAST NOTES (WEEPHOLES, CONNECTION PLATES, ETC.) INCLUDED IN PAST PRECAST CONCRETE BOX CULVERT PROJECTS ARE NO LONGER REQUIRED TO BE SHOWN ON THE PLANS. THESE NOTES HAVE BEEN ADDED TO SECTION 612 OF THE DELDOT STANDARD SPECIFICATIONS.
11. PLACEMENT OF WEEPHOLES: WHEN POSSIBLE, PLACE WEEPHOLE OUTLETS ABOVE THE OHW LINE. THE DESIGNER SHOULD CONSIDER USING WEEPHOLES WHERE SPRINGS ARE PREVALENT (PIEDMONT REGION) OR WHEN THE BRIDGE IS IN PRONOUNCED SAG/VALLEY. WEEPHOLES ARE GENERALLY NOT NEEDED WHEN THE STRUCTURE IS IN AN EMBANKMENT.
12. LIMITS FOR POTENTIAL EXCAVATION OF UNSUITABLE MATERIAL IN SECTION A-A AND B-B VIEWS NOT SHOWN FOR CLARITY. FOR PROJECTS THAT REQUIRE EXCAVATION OF UNSUITABLE MATERIAL, SHOW LIMITS OF THE EXCAVATION AND SPECIFY TYPE(S) OF BACKFILL TO BE USED ON SECTION A-A AND B-B VIEWS.
13. FOR ASTM C 1577 BOX CULVERTS, PROVIDE ADDITIONAL INFORMATION FOR THE DELDOT LOAD RATER UNDERNEATH THE 'LOAD RATING SUMMARY' ON THE PROJECT NOTES SHEET. THE ADDITIONAL INFORMATION SHOULD INCLUDE DESIGN EARTH COVER, REINFORCEMENT AREAS, CULVERT OPENING, DESIGN EFFECTIVE WIDTH, ETC. ENSURE THAT THE APPROVED WORKING DRAWINGS FOR ASTM C 1577 BOX CULVERTS ARE FORWARDED TO THE DELDOT LOAD RATER SINCE THE FINAL LOAD RATING WILL BE BASED ON THE CONSTRUCTED BOX CULVERT.

